

4.5 PSP Cover Sheet

Proposal title:

Assessment of habitat use, trophic status, contaminant loads, and distribution of the Chinese mitten crab (*Eriocheir sinensis*) in the freshwater habitats of the Sacramento and San Joaquin River Basins.

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Amount of funding requested \$343,083 for 1 years.

Indicate the topic for which you are applying.

-Introduced Species

Does the proposal address a specified Focused Action?

-Yes

What county or counties is the project located in?

Butte, Calaveras, Colusa, Contra Costa, Glenn, Fresno, Merced, Madera, Nevada, Placer, Sacramento, San Joaquin, Solano, Stanislaus, Sutter, and Yolo.

Indicate the geographic area of your proposal:

-Sacramento and San Joaquin River Drainage

Indicate the primary species which the proposal addresses:

-Chinese mitten crab (*Eriocheir sinensis*)

Specify the ERP strategic objective and target(s) with specific pages:

ERP Strategic Objectives/Targets	Pages in Volume I	Pages in Volume II
Restore primary and secondary food web production levels, by seeking to eliminate adverse effects of introduced aquatic species (Discussion of this topic has been limited to the Bay-Delta. We believe upstream areas also need to be considered especially with the introduction of mitten crab).	31, 40	81, 155
Maintain, protect, and improve riverine, freshwater fish, and essential fish habitat.	31, 40, 158, 162	--
Reduce competition for food and habitat and direct predation of key species by introduced aquatic species.	40, 420, 421, 423, 463	--

Reduce impacts to key species such as chinook salmon and steelhead trout.	460	28, 29
Lessen impacts and improve numbers of commercial species such as signal crayfish.	414	45
Develop feasible and non-destructive means of control for introduced species.	462, 467	81
Reduce adverse effects of stressors and/or eliminate stressors.	420, 422	--
Understand how invasive aquatic organisms affect ecological processes and interactions.	462	--

Indicate the type of applicant:

-Federal Agency

Indicate the type of project:

-Research

By signing below, the applicant declares the following:

- 1.) The truthfulness of all representations in their proposal;
- 2.) The individual signing the form is entitled to submit the application on behalf of the applicant; and
- 3.) The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section 2.4) and waves any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

Larry R. Brown

Name of applicant

Larry R. Brown

Signature of applicant

I. Project Title:

Assessment of the habitat use, trophic status, contaminant loads and distribution of the Chinese mitten crab (*Eriocheir sinensis*) in freshwater habitats of the Sacramento and San Joaquin River Basins.

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III. Type of Organization/Tax Status: Federal Agency

IV. Executive Summary

Project title: Assessment of the habitat use, trophic status, contaminant loads and distribution of the Chinese mitten crab (*Eriocheir sinensis*) in freshwater habitats of the Sacramento and San Joaquin River Basins.

Applicant names: Larry Brown, Jason May and Cliff Hui, U.S. Geological Survey, and Peggy Lehman, California Department of Water Resources

Project Description and Primary Ecological Objectives: Since the discovery of Chinese mitten crab (*Eriocheir sinensis*) in the South San Francisco Bay in 1993, the range and density of the Chinese mitten crab have rapidly expanded (Veldhuizen and Hieb, 1998). The main focus of research on the Chinese mitten crab has been localized within the Sacramento-San Joaquin Delta, with little study of the upstream portion of the life cycle (K. Hieb, personal comm.). *E. sinensis* is a catadromous organism which spends approximately 90% of its life cycle in freshwater habitats and then returns to estuaries and the ocean to spawn (Halat and Resh, 1996). A better understanding of the freshwater habits and distribution of *E. sinensis* is needed to fully evaluate its effects on the ecosystem. Additionally, there is a need to assess the contaminant loads of *E. sinensis* to help assess health risks for wildlife and humans that consume them.

The primary goals of this project are to determine: (1) habitat use of *E. sinensis*; (2) trophic status of different size classes of *E. sinensis*; and (3) contaminant loads of *E. sinensis*. A secondary goal is to determine the distribution of *E. sinensis* in selected streams that support populations of anadromous fish species to determine the degree of overlap between *E. sinensis* and anadromous fish populations.

Volume I of the Ecosystem Restoration Program Plan (ERP), Vision for Invasive Aquatic Organisms (pg. 463, February 1999) includes several strategic objectives or targets for restoration of ecological processes and function to the Sacramento-San Joaquin Rivers ecosystem. The results of the proposed study will provide basic knowledge required to assess the magnitude of the effects of *E. sinensis* on freshwater ecosystems. Such knowledge will help determine the relative importance of controlling this invasive species in relation to other invasive species. This study provides data addressing the following specific objectives: (1) Reduce competition for food and habitat and direct predation of key species by introduced species; (2) Restore primary and secondary food web production capacities, by seeking to eliminate adverse effects of introduced aquatic species; (3) Reduce impacts to key species such as striped bass, chinook salmon, and Sacramento splittail; and (4) Understand how invasive aquatic organisms affect ecological processes and interactions.

This research will encompass more than 1,000 miles of the Sacramento-San Joaquin River watershed. The findings of this project will support CALFED's objectives of protecting ecosystem health, maintaining water supply, upholding levee system integrity, and protecting human health.

Monitoring and Data Evaluation: Monthly monitoring at twelve selected sites, six in each watershed, will provide data on habitat use of *E. sinensis*. Monitoring methods will include trapping, beach seining, and electrofishing. Data will be collected over a six to eight month period depending on flow conditions. Trophic status of one or more size classes of *E. sinensis* will be established using stable isotope techniques. By determining stable isotope ratios within potential food sources and within tissues of *E. sinensis*, the importance of those foods in the diet of *E. sinensis* can be established. Results of tissue analyses for contaminant loads will provide important information for the assessment of health risk to wildlife and human populations. Data on the distribution of *E. sinensis* in streams supporting anadromous fishes will provide an initial assessment of the probability of significant interactions occurring among these species.

Budget Costs and Third Party Impacts: The cost for this study will be approximately \$343,083, assuming that the funding is received from an agency of the Department of the Interior. If funding is received from a different source, USGS-BRD requires a 16% overhead charge rather than waiving overhead. This will increase the cost slightly. This study appears to have no impact to third parties. Parties that may indirectly benefit from this study are commercial crayfish fishermen, the state and federal water transfer facilities and levee structural integrity interest groups.

Local Coordination with Other Programs and Compatibility with CALFED

Objectives: All counties in which work will occur have been notified by letter and will receive a copy of this proposal for their information and review. The principle investigators will be available for any questions. This work will complement ongoing and future mitten crab projects in the Sacramento-San Joaquin Delta and estuary including a proposal by the California Department of Water Resources (DWR) to evaluate mitten crab interactions with the benthic invertebrate community of the Sacramento-San Joaquin Delta and a project starting in Spring 1999, headed by Tanya Veldhuizen, that will focus on habitat use of mitten crab in the Sacramento-San Joaquin Delta. Data collected on habitat use, trophic position, contaminant loadings and distribution of *E. sinensis* in the freshwater habitats of the Sacramento and San Joaquin rivers will be shared with the Interagency Ecological Program (IEP) and California Department of Fish and Game (CDFG), which will serve as a preliminary clearinghouse for data until CALFED implements its own data archival and distribution system. This study will provide essential data for understanding the full range of impacts of this non-indigenous species within the Sacramento-San Joaquin River drainage.

This study will provide important data on the habits of *E. sinensis* within the freshwater ecosystems of the Sacramento-San Joaquin River drainage. The freshwater phase of the life cycle of *E. sinensis* is virtually unknown. This information will be useful for habitat management and restoration efforts for important game and endangered species.

This project will also provide ancillary information for CALFED's objectives of ensuring adequate movement of water through the state and federal water pumping facilities and the potential impacts of *E. sinensis* on levee structural integrity with the

freshwater habitats of the Sacramento-San Joaquin river systems.

V. Project Description

This project will address the following aspects of the biology of *E. sinensis* within the freshwater portions of the Sacramento-San Joaquin ecosystem: (1) habitat use; (2) trophic position of different size classes of *E. sinensis* in the food web; (3) contaminant body burdens, and (4) distribution of *E. sinensis* in selected watersheds.

Primary Questions/Hypotheses to be Addressed:

1. What habitat types does *E. sinensis* use in the freshwater portions of the Sacramento-San Joaquin River drainage?
2. What is the trophic position of different size classes of *E. sinensis* in the freshwater habitats of the Sacramento-San Joaquin River drainage?
3. What specific contaminants and concentrations of contaminants are sequestered within the tissues of *E. sinensis*?
4. What is the distribution of *E. sinensis* in selected watersheds that are of concern because of anadromous fish species?

Each of the following tasks could be funded as a separate study; however, an integrated understanding of the biology of *E. sinensis* in the freshwater habitats of the Sacramento-San Joaquin River systems requires the multi-disciplinary approach of the proposed study.

Task 1: Identify habitat use of *E. sinensis* in freshwater:

Habitat use of *E. sinensis* in the Sacramento and San Joaquin River watersheds will be determined at several site types including mainstem river sites, tributary river sites, and agricultural drains (Table 1, Attachment A). Evaluation of several site types will provide for a better understanding of the full range of potential impacts of *E. sinensis* on the Sacramento-San Joaquin River ecosystem. Collection efforts at a total of twelve selected sites will consist of trapping crabs from different types of habitats, which may include any of the following: main channel, near-shore habitats, and back waters. Additionally, the habitat types may be further stratified on the basis of available cover such as aquatic vegetation, woody debris, and rip rap. Electrofishing and beach seining will be used as supplementary techniques to provide additional data and verify the results of the trapping. These techniques will provide data on relative abundance of mitten crab in the various habitats at each site.

Monthly sampling will provide information on habitat use during maturation of *E. sinensis* in the freshwater habitats of the Sacramento-San Joaquin river system. Sampling will be conducted approximately eight months (March 2000-October 2000).

Task 2: Trophic position of *E. sinensis*:

Effective control of invasive species such as *E. sinensis* requires a proper understanding the position of the species in the trophic web of the ecosystem. Determination of food habits from gut contents can be difficult because of diel

fluctuations in feeding intensity, distortion of prey items by partial digestion and/or maceration of prey items, and different rates of digestion of different food items. Also, consumption of a type of food item does not necessarily mean it is important to the nutrition of the organism. This problem is particularly acute for omnivorous organisms, such as *E. sinensis*, which consume a wide array of animal, vegetable, and detrital material with very different digestibilities. This problem is most easily addressed by using stable isotopes as a means to determine the trophic position of *E. sinensis* in the food web structure of the freshwater habitats of the Sacramento-San Joaquin River system. Determination of the potential trophic impacts *E. sinensis* is an essential step in understanding full range impacts of *E. sinensis* on the ecosystem.

Natural stable isotope ratios are routinely used to identify the diet of aquatic organisms (Fry, 1988; Peterson and Fry, 1987; Boon and Bunn, 1994; Minagawa and Wada, 1984) and would be ideal for this study. The wide range of potential food sources for *E. sinensis* have very distinct and easily measurable isotopic ratios. This study will determine the seasonal use by different size classes of *E. sinensis* of detritus, periphyton, macrophytes, amphipods, and other stream invertebrates. These studies will be conducted at selected sites (Table 1, Attachment A) during Spring (April/May 2000) and Late Summer/Autumn (August/September 2000).

The primary goal of task 2 is to sample potential food sources (detritus, periphyton, macrophytes, amphipods, and other stream invertebrates) of one or more size classes of *E. sinensis* for analysis of natural stable isotopes including $\delta^{34}\text{S}$, $\delta^{13}\text{C}$, and $\delta^{15}\text{N}$. These data are then used to determine the food sources important to the nutrition of *E. sinensis* and to establish trophic relationships between *E. sinensis* and its potential food resources. Sampling will occur seasonally to ensure sampling of a juvenile life stage and of a pre-downstream migration adult life stage.

Task 3: Determine contaminants loads within tissues of *E. sinensis*:

The benthic habits of the Chinese mitten crab facilitates its exposure to contaminants in sediments. Chinese mitten crab has been reported to contain greater concentrations of some metals occurring in both the water column and the sediments than do shrimps inhabiting only the water column (Ong Che and Cheung, 1998). *E. sinensis* is also known to accumulate mercury (Bianchi and Gilles, 1996). Concentrations of some contaminants could reach levels that are unsafe for human consumption or consumption by other predators in the ecosystem.

The contaminant burdens of *E. sinensis* occurring at sites (Table 1, Attachment A) with known high levels of specific contaminants in the sediment (Brown, 1997, 1998; Domagalski, 1998; MacCoy, in press) will indicate the maximum exposure that consumers of crabs might experience. By comparing the data from mitten crabs at sites with known high sediment concentrations of some contaminants to data from mitten crabs collected at sites with lower contaminant concentrations in sediments and to data from a random selection of crabs from the entire Central Valley drainage, ranges and risks of exposure can be estimated for various consumers.

Because different consumers eat different portions of the mitten crab (e.g. humans may eat the muscle and reproductive organs; wading birds may eat the entire crab),

and because different contaminants are concentrated in different tissues (e.g. lead in calcium-rich tissues like the carapace, organochlorine pesticides in fatty tissues), the specimens need to be divided into different tissue types for contaminant analysis. The tissues to be analyzed will be the hepatopancreas/gonads, muscle, and carapace.

Specimens will be collected at three sites, each previously reported to have a high sediment level of either mercury, DDT metabolites, or polycyclic aromatic hydrocarbons (PAHs are products of combustion and may be carcinogenic). Because each site has high levels of only one contaminant type, each site can serve as a low concentration comparison site for the other two contaminant types. Specimens representing a sampling of the entire Central Valley drainage will be collected from the Sacramento-San Joaquin Delta at Carquinez Strait between the cities of Vallejo and Benicia. Collections will occur in August/September 2000, near the start of the downstream spawning migration. Adult crabs (both sexes) will be collected so that each specimen will have had the maximum amount of time to accumulate contaminants.

Chemical analyses will determine concentrations of 19 inorganic contaminants, organochlorine compounds (DDT and metabolites), and aromatic compounds (for PAHs).

Task 4: Assess the distribution of *E. sinensis* in streams supporting anadromous fishes:

Concerns have been expressed by the some members of the IEP mitten crab project work team regarding the potential impacts of *E. sinensis* on anadromous fish populations (K. Hieb, personal comm.). The goal of task 4 is to assess the distribution of *E. sinensis* in selected reaches of the mainstem and tributaries of the Sacramento and San Joaquin river systems that are of concern because they support populations of anadromous fishes. Distribution will be assessed in at least three streams in each of the Sacramento and San Joaquin river drainages. Preliminary selections in the Sacramento River drainage include the Yuba River, the American River, and Butte Creek. Preliminary selections in the San Joaquin River drainage include the Stanislaus, Tuolumne, and Merced rivers. Initial sampling locations on each stream will be based on previous distributional records. Sampling will begin in these areas and proceed upstream until no evidence of mitten crabs is found. Methods of capture may include electrofishing, seining, trapping, netting, visual surveys, fishermen surveys, and hook and line. Sampling period to investigate distribution of *E. sinensis* will occur on a monthly basis from March 2000 to October 2000.

Task 5: Writing and presenting finding of research:

Deliverables will include quarterly data submissions to the Interagency Ecological Program web site, until CALFED implements its own data archival and distribution system, and brief quarterly progress reports to the quarterly IEP Newsletter. The same material will be submitted to the California Department of Fish and Game. Reports will include a final report of results to CALFED and related publications in peer-reviewed professional journals. Results of the project will also be presented at professional

meetings.

Location/Geographic Boundaries of the Project:

The study sites of this project are located in the following counties: Butte, Calaveras, Colusa, Contra Costa, Fresno, Glenn, Madera, Merced, Nevada, Placer, Sacramento, San Joaquin, Solano, Stanislaus, Sutter, and Yolo. See attached map for project boundaries. Proposed study sites and site codes are listed in Table 1, Attachment A.

VI. Ecological/Biological Benefits

This project will significantly improve our understand of the full life cycle of *E. sinensis* in the Sacramento-San Joaquin River system. Primary goals of this project are to determine habitat use, trophic position, contaminant loads and distribution of *E. sinensis* in selected watersheds. Additionally, the findings from this study will provide linkages of upstream life cycle information with ongoing research focused in the Sacramento-San Joaquin Delta and estuary.

The full impacts of *E. sinensis* in the Sacramento-San Joaquin ecosystem are not fully understood at this time. Data from other geographic areas where mitten crab is native or where it has previously been introduced may not be applicable in our area because of geographic variation in life history characteristics (Henmi, 1993; T. Grosholtz, K. Hieb, and T. Veldhuizen personal comm., 1999). Ongoing and proposed work in the Sacramento-San Joaquin river system primarily focuses on the estuarine component of the life cycle. Work is also needed on the freshwater component of the life cycle to fully understand the effects of this species on the ecosystem and to accurately assess the importance of those effects in the context of CALFED goals and objectives. Results of the study will be applicable to a number of CALFED objectives and targets (Table 2).

System-Wide Ecosystem Benefits:

This study will complement ongoing studies centered in the Sacramento-San Joaquin Delta and estuary. Data on the upstream ecology of *E. sinensis* will help provide a complete understanding of the ecology of this invasive species and allow for assessment of all impacts on commercial and sport fisheries, endangered species and general ecosystem function.

Compatibility with Non-Ecosystem Objectives:

The results of this study will be useful to CALFED programs other than the Ecosystem Restoration Program. Concerns have been expressed regarding the potential impacts of *E. sinensis* on the structural integrity of levee systems and water transfer (pumps) systems of the Sacramento-San Joaquin river system. Another area of potential concern is the impact of *E. sinensis* on agricultural community, specifically rice growers. In China, where *E. sinensis* is native there have been reports of juveniles consuming young rice shoots (Veldhuizen and Stanish, 1999; Halat, 1996). This study will provide useful information for assessing the potential impacts of *E. sinensis* on

water transfer capabilities, the agricultural community, and the structural integrity of levees.

VII. Technical Feasibility and Timing

A variety of methods of capturing mitten crabs are currently being tested (T. Veldhuizen, personal comm., 1999). It seems likely that no single method will be optimal for all sizes and life stages of mitten crab. The combination of sampling methods proposed is the best available and will be modified as sampling methodologies are developed by others and during preliminary testing (unfunded) of our own trap designs and sampling methods. The methodologies proposed for determining trophic status of mitten crab and contaminant concentrations in tissues of mitten crab are well established. The probability of technical problems preventing completion of the work is remote. No local examples exist of alternative approaches for determining distributional patterns of Chinese mitten crabs during their upstream migration and foraging periods. The multiple technique sampling protocol proposed is the best available.

The sampling period will begin at the end of the wet season and will include the major portion of the Chinese mitten crab life cycle in freshwater. The sampling season is planned for March 2000 through October 2000. The sampling period could be shortened in an extremely wet year because of high river flows but such circumstances can not be anticipated. The proposed sampling period is practical in most years. Scientific collection permits will be amended or renewed as appropriate for the methods and specific locations needed for this study.

VIII. Monitoring and Data Collection Methodology:

Ecological Objectives:

The objectives of this study are the following:

1. Determine habitat use of *E. sinensis* at selected sites within the Sacramento-San Joaquin River system.
2. Use stable isotope analysis to determine the trophic position of one or more different size classes of mitten crabs.
3. Determine tissue burdens of selected contaminants (mercury and other inorganic elements, DDT and metabolites, PAHs) in *E. sinensis*.
4. Document the distribution of *E. sinensis* in selected stream reaches within the Sacramento-San Joaquin River drainage that are of concern because of anadromous fish species.
5. Produce high-quality interpretative journal articles of the study findings.

Monitoring Parameters and Data Collection Approach:

Task 1 will be addressed through monthly sampling, between March 2000 and October 2000, at selected sites to determine the habitat use of *E. sinensis*. Mitten crabs will be collected primarily by trapping within specific habitat types of interest. Data will be in the form of catch per unit effort (CPUE), number of mitten crabs caught

per hour within each habitat type. As a check on trapping efficiency, mitten crabs will also be sampled by electrofishing and seining. These data will be quantified as the number of crabs caught per time electrofishing or the number of crabs captured per surface area of water seined. Habitat use will be established on the basis of CPUE of mitten crabs within specific habitats at a site.

Task 2 will include seasonal sampling (April/May 2000 and August/September 2000) of possible mitten crab food types for stable isotope ratios of $\delta^{34}\text{S}$, $\delta^{13}\text{C}$, and $\delta^{15}\text{N}$. These data, in conjunction with stable isotope ratios in tissues of mitten crabs from one or more size classes will be used to calculate the percentages of each food type contributing to the diet of the mitten crabs. These results will clarify the trophic position of mitten crabs in the food web and will allow the potential direct and indirect impacts of *E. sinensis* on the food web to be evaluated. Sampling will be conducted at four selected sampling sites, two each from the Sacramento and San Joaquin river basins (Table 1, Attachment A).

Task 3 will include collection of mitten crab specimens (five of each sex) during August-September 2000, from Orestimba Creek (high concentrations of DDT and metabolites), Dry Creek (high concentrations of PAHs), Bear River (high concentrations of mercury), and the Sacramento-San Joaquin Delta between the cities of Vallejo and Benicia. The specimens will be frozen until the tissues are separated in preparation for chemical analyses. Each individual will have separate analyses on muscle, carapace, and hepatopancreas/gonad tissues. Each tissue sample will be placed in a certified chemically clean jar and maintained frozen until analyses. Analyses for inorganic elements, organochlorines, and polycyclic aromatic hydrocarbons will be conducted by laboratories under contract with the US Fish and Wildlife Service which monitors contracts and quality via its Patuxent Analytical Control Facility in Laurel, Maryland.

Task 4 will include monthly sampling for approximately eight months (March 2000-October 2000) to assess the distribution of *E. sinensis* within selected reaches of the mainstem and tributaries of the Sacramento and San Joaquin rivers. Sampling within each reach will be conducted using one or more of a variety of methods including electrofishing, seining, visual observations, fishermen surveys, trapping, and hook and line. Sampling will begin at the most upstream location where mitten crabs have previously been reported and will continue upstream until no evidence of *E. sinensis* is found. Data will primarily consist of the presence or absence of *E. sinensis* at specific locations. A latitude and longitude will be recorded for each site using a GPS unit and a map of the resulting distribution will be constructed. Monitoring parameters and data collection approaches for each objective are summarized in Table 3.

IX. Deliverables and Data Release

Deliverables will include quarterly data submissions to the Interagency Ecological Program web site, until CALFED implements its own data archival and distribution system, and brief quarterly progress reports to the quarterly IEP Newsletter. The same material will be submitted to the California Department of Fish and Game. Reports will include a final report of results to CALFED and related publications in peer-reviewed professional journals.

X. Data Evaluation Approach, Analytical Techniques, and Data Analysis

Task 1 data will be analyzed as CPUE of mitten crabs within the specific habitat types available within each study reach. Analyses will be conducted for one or more size classes. Size classes of mitten crabs for analysis will be defined after evaluation of length frequency histograms of carapace width. Differences among size classes or sample areas will be explored with a variety of techniques including simple graphical analyses and Chi-square comparisons. Other more complex statistical analyses including analysis of variance and multivariate analyses may also be used if the data are appropriate.

Task 2 data will consist of single and multiple analyte comparisons of naturally occurring carbon and nitrogen isotope ratios in tissues of mitten crab and potential food sources. Differences in ratios among the food sources will allow determination, using simple mixing equations, of the percent of each food source in the diet of mitten crab. Isotope ratios will be determined from pooled samples of similar taxa (modified from Boon and Bunn, 1994). The most probable diet of mitten crabs is determined by calculation of mixing equations which determine the combination of food organisms required to account for the stable isotope ratios within the flesh of the mitten crabs.

Task 3 data will be analyzed for differences among mitten crabs from different sites in contaminant concentrations contained in specific tissues. Contaminant concentrations in tissues of mitten crabs from each site will also be compared with previously collected sediment contaminant concentrations as an indication of how contaminant concentrations in mitten crabs may be related to sediment concentrations and the ability of the mitten crab to accumulate certain contaminants. Differences between sexes and concentration ranges of each contaminant will also be determined. Statistical comparisons will be made with analysis of variance or the nonparametric equivalents.

Task 4 data will be analyzed as the presence or absence of mitten crabs at specific sites. These data will be used to prepare distributional maps for the streams surveyed. Data analysis approaches for each task are summarized in Table 3.

XI. Local Involvement

At this time no local groups have been involved with the design of this study. Access to sites will be through public access routes. If there is an unforeseen need to access private property, most likely for Task 4, permission to access the area will be obtained from land owners before the work proceeds. All counties in which work will occur have been notified by letter and will receive a copy of this proposal for their information and review. The principle investigators will be available for any questions.

XII. Cost

Total cost of the project will be \$343,083, assuming that the funding is received from an agency of the Department of the Interior. If funding is received from a different source, USGS-BRD requires a 16% overhead charge rather than waiving overhead. This will increase the cost slightly. All costs are shown in Table 3. Projected quarterly

expenditures are shown in Table 4.

XIII. Schedule of accomplishing tasks and reports:

Oct-Dec 1999: Preparation and acquisition of equipment and materials

Jan-Mar 2000: Start tasks 1 and 4 in March 2000

Apr-Jun 2000: Continue tasks 1 and 4; Complete first portions of task 4 in April 2000

Jul-Sept 2000: Continue tasks 1 and 4; Complete portions of tasks 2 and 3 in Sep 2000

Oct-Dec 2000: Finish tasks 1, 3 and 4 in October 2000.

Dec 2000-Jul 2001: Generate finished reports/articles and present findings.

XIV. Applicant Qualifications

Personnel:

USGS, Water Resources Division California District Office, Sacramento

Larry Brown (Biologist, GS-13) received a Ph.D. in Ecology from the University of California at Davis in 1988. Dr. Brown worked as a Post-graduate Researcher at U.C. Davis from 1988-1991. Starting in August 1991, Dr. Brown has worked for the USGS as an Aquatic Biologist, except for a brief period (June 1997 through January 1999) spent on a temporary assignment with the U.S. Bureau of Reclamation. Dr. Brown has extensive experience in the aquatic ecology of California rivers and streams. Dr. Brown will be the project chief/coordinator for this study and will also participate in data analysis and report writing.

Jason May (Biologist GS-7/9) has a B.S. in Aquatic Ecology from the University of California at Davis. He has several years of experience in the field of aquatic ecology and invertebrate zoology and is currently serving as a biologist for the USGS National Water-Quality Assessment Program in the Sacramento River Basin. Jason May will lead the field operations, oversee data entry, conduct data analyses, and participate in report writing.

USGS, Biological Resources Division Western Ecological Research Center, Davis Field Station

Clifford Hui (Biologist GS-13) received a Ph.D. in Environmental Physiology from the University of California at Los Angeles in 1983. For eight years Dr. Hui was Station Leader of the Davis Field Station where research focused on the impacts of contaminants on wildlife. Dr. Hui will take the lead in the contaminant analysis portion of this project.

California Department of Water Resources

Environmental Services Office, Sacramento

Peggy Lehman (Environmental Scientist, ES-IV) has a Ph.D. in ecology from the University of California at Davis. Dr. Lehman has used stable carbon and nitrogen ratios to measure growth and nutrient kinetics in estuarine ecosystems and will be responsible for the stable isotope analysis. The isotope analysis will be done in conjunction with Dr. Howey Spero and Dr. R. Zierenberg at UC Davis, who are authorities in the area of isotopic analysis. Dr. R. Zierenberg has experience with the use of isotopes in ocean food webs, including deep sea vent communities, which include crabs.

XV. References

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Minagawa, M. and E. Wada, 1984. Stepwise enrichment of ^{15}N along food chains: Further evidence and the relation between ^{15}N and animal age. *Geochem. et Cosmo. Acta* 48:1135-1140.

Ong Che, R and S. Cheung, 1998. Heavy metals in *Metapenaeus enis*, *Eriocheir sinensis* and sediment from the Mai Po marshes, Hong Kong. *Sci Tot. Env.* 214:87-97.

Peterson, B. and B. Fry, 1987. Stable isotopes in ecosystem studies. *Ann. Rev. Ecol. Syst.* 18:293-320

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Veldhuizen, T. and S. Stanish 1999. Overview of the life history, distribution, abundance, and impacts of the Chinese mitten crab, *Eriocheir sinensis*. Report to the California Department of Water Resources, Sacramento, California.

Table 1. Proposed study sites for mitten crab studies for tasks 1, 2, and 3.

		Task		
Site	Code	Habitat use	Trophic status	Contaminants
San Joaquin River System				
Mainstem sites				
San Joaquin River near Vernalis	SJ1	X	X	--
San Joaquin River near Patterson	SJ2	X	--	--
San Joaquin River near Stevinson	SJ3	X	--	--
Carquinez Strait, Sacramento-San Joaquin delta between Vallejo and Benicia (for contaminant range and frequency)	CS	--	--	X
Tributary/drain sites				
Merced River at George Hatfield State Park	MR	X	X	--
Tuolumne River at Modesto	TR	X	--	--
Orestimba Creek near Crows Landing (for DDT and metabolites)	OC	--	--	X
Dry Creek (for PAHs)	DC	--	--	X
Salt Slough near Stevinson	SS	X	--	--
Sacramento River Drainage				
Mainstem sites				
Sacramento River at Freeport	SAC1	X	--	--
Sacramento River at Sacramento	SAC2	X	--	--
Sacramento River near Colusa	SAC3	X	X	--
Tributary/drain sites				
Feather River near Nicholas	FR	X	X	--
Sacramento Slough near Karnak	SACS	X	--	--
Bear River near Highway 70 (for Hg)	BR	X	--	X

Table 2. Ecosystem Restoration Program strategic objectives and targets that will be facilitated by data collected in this project. Pages in Volumes I and II of the Ecosystem Restoration Program Plan (February 1999) referring to the specific objectives and targets are indicated.

ERP Strategic Objectives/Targets	Pages in Volume I	Pages in Volume II
Restore primary and secondary food web production levels, by seeking to eliminate adverse effects of introduced aquatic species (Discussion of this topic has been limited to the Bay-Delta. We believe upstream areas also need to be considered especially with the introduction of mitten crab).	31, 40	81, 155
Maintain, protect, and improve riverine, freshwater fish, and essential fish habitat.	31, 40, 158, 162	--
Reduce competition for food and habitat and direct predation of key species by introduced aquatic species.	40, 420, 421, 423, 463	--
Reduce impacts to key species such as chinook salmon and steelhead trout.	460	28, 29
Lessen impacts and improve numbers of commercial species such as signal crayfish.	414	45
Develop feasible and non-destructive means of control for introduced species.	462, 467	81
Reduce adverse effects of stressors and/or eliminate stressors.	420, 422	--
Understand how invasive aquatic organisms affect ecological processes and interactions.	462	--

Table 3. Monitoring parameters, data collection approaches, and data evaluation approaches used to address the ecological objectives of the study.

Ecological Objectives, Hypotheses, and Questions	Parameters and Approach	Data Evaluation Approach	Comments/Data Priority
What habitat types do mitten crabs use in freshwater? (task 1)	Sample different habitat types for <i>E. sinensis</i> on a monthly basis.	Assess Catch Per Unit Effort (CPUE) in different habitat types.	Establish patterns of freshwater habitat use for <i>E. sinensis</i> . High Priority
What foods do mitten crabs consume and do they vary spatially, temporally, and with crab size? (task 2)	Sample various biota for stable isotope ratios of $\delta^{13}\text{C}$, $\delta^{34}\text{S}$ and $\delta^{15}\text{N}$ on a seasonal basis	Evaluate the relative fractionation of stable isotopes present within the tissue of various biota.	Determine the food sources important to nutrition of <i>E. sinensis</i> . Use the results to assess potential direct and indirect effects on other species. High Priority
What are the contaminant loadings in the tissues of mitten crab? (task 3)	Sample <i>E. sinensis</i> for inorganic, organochlorine, and PAH compounds.	Compare contaminant concentrations in mitten crab tissues among sites and relative to sediment concentrations obtained from previous studies at those sites..	Will provide information on bioconcentration of contaminants by crabs and potential threats to health of human and other consumers of crabs. High Priority
What is the distribution of mitten crabs in stream reaches supporting anadromous fish populations? (task 4)		Establish presence or absence of mitten crabs at sites with known GPS coordinates	Establish a distributional map. High Priority
Report Writing (task 5)		Quarterly reports, final report, and articles in peer-reviewed professional journals.	High Priority

Table 4. Total budget by task.

Personnel	Direct Labor Hours	Hourly Rate	Direct Salary and Benefits	Materials and Acquisition Costs	Analytical Costs	Miscellaneous Costs (including vehicles and fuel)	Total Direct Costs ¹	Overhead Rate Applied ²	Overhead and Indirect Costs	Direct Costs + Overhead and Indirect Costs	Total by Task
Task 1: Habitat Use											
Jason May	320	19.40	6208				6208	USGS-WRD	5965	12173	
Technician GS 5/6	320	15.63	5002				5002	USGS-WRD	4806	9808	
equipment and supplies:				9000			9000	USGS-WRD	8684	17684	
travel and vehicle costs ³ :						11400	11400	USGS-WRD	10953	22353	
Total for Task 1:											61982
Task 2: Trophic Status											
Jason May	120	19.40	2328				2328	USGS-WRD	2237	4565	
Technician GS 5/6	120	15.63	1563				1563	USGS-WRD	1502	3065	
Peggy Lehman	25	40.00	1012				1012	DWR	481	1493	
supplies:				2000			2000	USGS-WRD	1922	3922	
sample analysis:					16000		16000	USGS-WRD	12304	28304	
Total for Task 2:											41349
Task 3: Contaminants											
Jason May	80	19.40	1552				1552	USGS-WRD	1492	3044	
Technician GS 5/6	80	15.63	1251				1251	USGS-WRD	1201	2452	
Cliff Hui	80	40.38	3231				3555	USGS-BRD	0	3231	
sample analysis:					120000		132000	USGS-BRD	0	132000	

Personnel	Direct Labor Hours	Hourly Rate	Direct Salary and Benefits	Materials and Acquisition Costs	Analytical Costs	Miscellaneous Costs (including vehicles and fuel)	Total Direct Costs ¹	Overhead Rate Applied ²	Overhead and Indirect Costs	Direct Costs + Overhead and Indirect Costs	Total by Task
equipment and supplies:				2500			2750	USGS-BRD	0	2750	
travel costs, office costs:						4000	4400	USGS-BRD	0	4400	
Total for Task 3:											147877
Task 4: Distribution											
Jason May	320	19.40	6208				6280	USGS-WRD	5965	12173	
Technician GS 5/6	320	15.63	5002				5002	USGS-WRD	4806	9808	
Total for Task 4:											21981
Task 5: Reports, Deliverables, and Data Analysis											
Jason May	80	19.40	1552				1552	USGS-WRD	1492	3044	
Peggy Lehman	175	40.00	7086				7086	DWR	3370	10456	
Cliff Hui	460	40.38	18575				20433	USGS-BRD	0	20433	
Larry Brown	150	32.13	4820				4820	USGS-WRD	4630	9450	
Editor	80	36.75	2940				2940	USGS-WRD	2825	5765	
Editorial staff assistant	40	22.00	880				880	USGS-WRD	846	1726	
Illustrator	40	22.00	880				880	USGS-WRD	846	1726	
printing costs:				4000			4000	USGS-WRD	3844	7844	
Total for Task 5:											60444
Task Management											
Larry Brown	150	32.13	4820				4820	USGS-WRD	4630	9450	
Total for Task Management:											9450

Personnel	Direct Labor Hours	Hourly Rate	Direct Salary and Benefits	Materials and Acquisition Costs	Analytical Costs	Miscellaneous Costs (including vehicles and fuel)	Total Direct Costs ¹	Overhead Rate Applied ²	Overhead and Indirect Costs	Direct Costs + Overhead and Indirect Costs	Total by Task
Total Cost of Project:											343083

¹ USGS-WERC, Western Ecological Research Center, other direct costs 10% of net cost. The USGS-BRD office involved is a field office of the USGS-WERC.

² Overhead rates:

USGS-WRD standard overhead, 49% of gross cost = 12.5%-National Program Overhead + 36.5%-California District Office Overhead (rent, phones, furniture, office staff, etc.)

USGS-WRD, California District Office Overhead for Laboratory Services, 24% of gross cost

USGS-BRD, National Program Overhead, 0% of net cost. This overhead rate is charged if the funds come through an agency of the Department of the Interior. It is our understanding that these funds will come through the U.S. Bureau of Reclamation. If the funds come through a non-Department of Interior Agency, an overhead rate of 16% of net costs will have to be added to USGS-BRD charges.

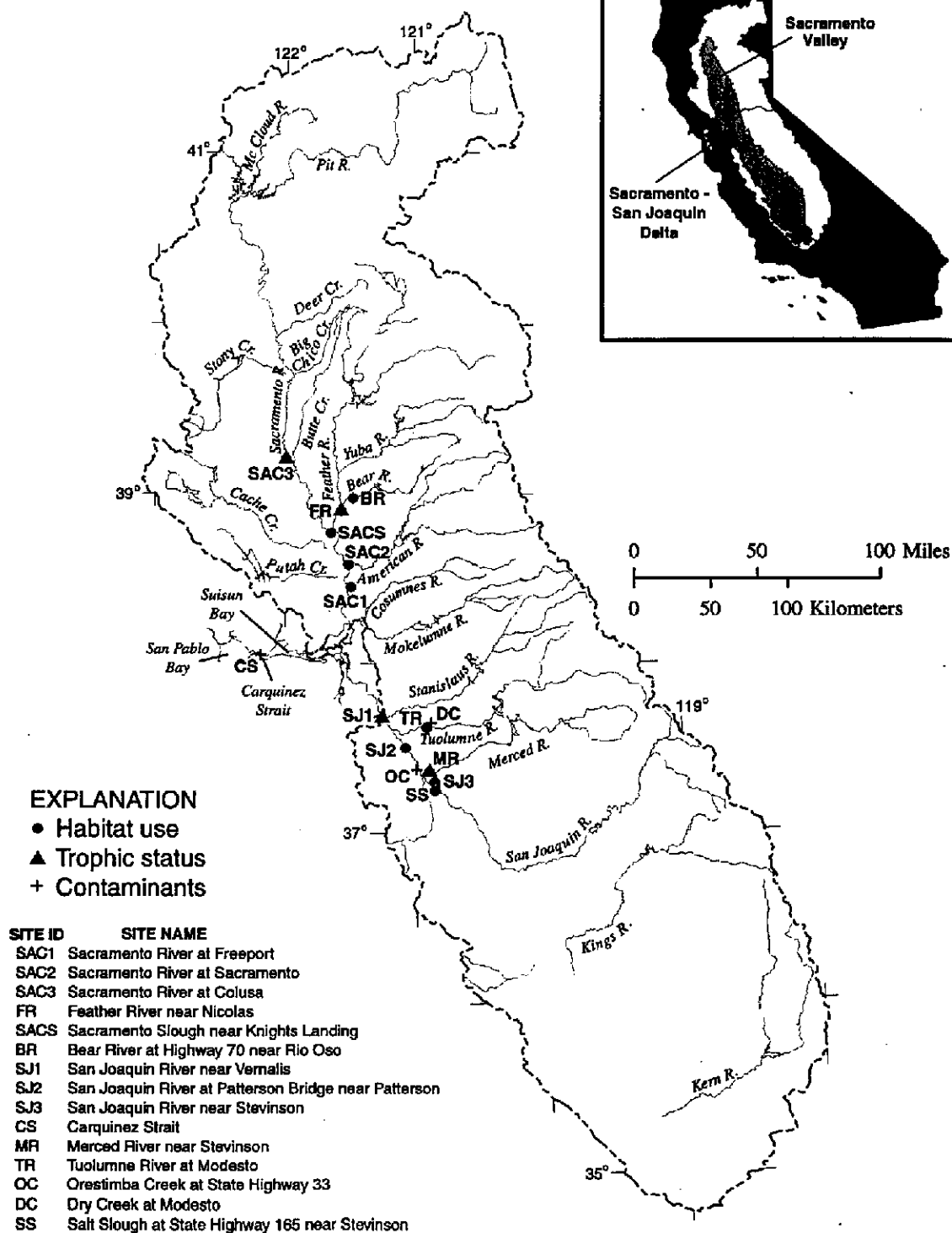
DWR, 47.6% of net salary and benefits.

³ USGS-WRD travel costs for all tasks are combined in this item because we anticipate combining work for all tasks into the same field trips. If only some tasks are funded, these costs will have to be adjusted.

Table 5. Quarterly budget.

Task	Oct-Dec 1999	Jan-Mar 2000	Apr-Jun 2000	Jul-Sep 2000	Oct-Dec 2000	Jan-Mar 2001	Apr-Jun 2001
Task 1 Habitat Use		15496	15495	15495	15496		
Task 2 Trophic Status			13783	13783	13783		
Task 3 Contaminant Loadings				6388	135100	6389	
Task 4 Distribution		5496	5495	5495	5495		
Task 5 Reports, Deliverables				15111	15111	15111	15111
Task Management		1575	1575	1575	1575	1574	1575
Total		22567	36348	58358	205971	23584	17197

Attachment A: Proposed Sites for Chinese Mitten Crab Study





United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Placer Hall, 6000 "J" Street
Sacramento, California 95819-6129
Phone: (916) 278-3098
FAX: (916) 278-3071

April 7, 1999

Letter of intent to the County Board of Supervisors and the Planning Department for the following counties:

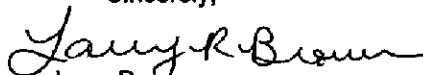
Butte, Glenn, Sutter, Colusa, Nevada, Placer, Yolo, Calaveras, Sacramento, San Joaquin, Solano, Contra Costa, Merced, Madera, Stanislaus, and Fresno.

Dear County Board Supervisor or Planning member,

This is a letter to inform you of a CALFED category III proposal for work to be undertaken in your county. Specifically, this research will focus on the growing problem of the Chinese mitten crab (*Eriocheir sinensis*) within the freshwater habitats of the Sacramento and San Joaquin river systems. Attached to this letter is a copy of the proposed work. Currently, all sites selected for work are open to public access. If there is a need to access private property then adequate permission will be obtained. Please feel free to contact the principal investigators with any questions that you may have.

Thank you for your understanding and cooperation.

Sincerely,


Larry Brown,
Aquatic Ecologist

U.S. Department of the Interior

**Certifications Regarding Debarment, Suspension and
Other Responsibility Matters, Drug-Free Workplace
Requirements and Lobbying**

Persons signing this form should refer to the regulations referenced below for complete instructions:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions - The prospective primary participant further agrees by submitting this proposal that it will include the clause titled, "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions. See below for language to be used; use this form for certification and sign; or use Department of the Interior Form 1954 (DI-1954). (See Appendix A of Subpart D of 43 CFR Part 12.)

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions - (See Appendix B of Subpart D of 43 CFR Part 12.)

Certification Regarding Drug-Free Workplace Requirements - Alternate I. (Grantees Other Than Individuals) and Alternate II. (Grantees Who are Individuals) - (See Appendix C of Subpart D of 43 CFR Part 12)

Signature on this form provides for compliance with certification requirements under 43 CFR Parts 12 and 18. The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of the Interior determines to award the covered transaction, grant, cooperative agreement or loan.

**PART A: Certification Regarding Debarment, Suspension, and Other Responsibility Matters -
Primary Covered Transactions**

CHECK IF THIS CERTIFICATION IS FOR A PRIMARY COVERED TRANSACTION AND IS APPLICABLE.

- (1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
 - (b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
 - (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- (2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

**PART B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -
Lower Tier Covered Transactions**

CHECK IF THIS CERTIFICATION IS FOR A LOWER TIER COVERED TRANSACTION AND IS APPLICABLE.

- (1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- (2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

PART C: Certification Regarding Drug-Free Workplace Requirements

CHECK ☒ IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS NOT AN INDIVIDUAL

Alternate I. (Grantees Other Than Individuals)

A. The grantee certifies that it will or continue to provide a drug-free workplace by:

- (a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;
- (b) Establishing an ongoing drug-free awareness program to inform employees about—
 - (1) The dangers of drug abuse in the workplace;
 - (2) The grantee's policy of maintaining a drug-free workplace;
 - (3) Any available drug counseling, rehabilitation, and employee assistance programs; and
 - (4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;
- (c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);
- (d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will —
 - (1) Abide by the terms of the statement; and
 - (2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;
- (e) Notifying the agency in writing, within ten calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification numbers(s) of each affected grant;
- (f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted —
 - (1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
 - (2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;
- (g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a) (b), (c), (d), (e) and (f).

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county, state, zip code)
Placer Hall, 6000 J Street, Sacramento, CA
Sacramento County 95819-6129

Check ☐ if there are workplaces on file that are not identified here.

PART D: Certification Regarding Drug-Free Workplace Requirements

CHECK ☐ IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS AN INDIVIDUAL

Alternate II. (Grantees Who Are Individuals)

- (a) The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity with the grant;
- (b) If convicted of a criminal drug offense resulting from a violation occurring during the conduct of any grant activity, he

PART E: Certification Regarding Lobbying
Certification for Contracts, Grants, Loans, and Cooperative Agreements

CHECK IF CERTIFICATION IS FOR THE AWARD OF ANY OF THE FOLLOWING AND
THE AMOUNT EXCEEDS \$100,000: A FEDERAL GRANT OR COOPERATIVE AGREEMENT;
SUBCONTRACT, OR SUBGRANT UNDER THE GRANT OR COOPERATIVE AGREEMENT.

CHECK IF CERTIFICATION IS FOR THE AWARD OF A FEDERAL
LOAN EXCEEDING THE AMOUNT OF \$150,000, OR A SUBGRANT OR
SUBCONTRACT EXCEEDING \$100,000, UNDER THE LOAN.

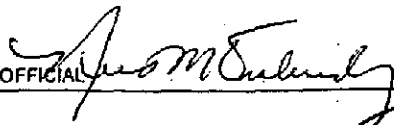
The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

As the authorized certifying official, I hereby certify that the above specified certifications are true.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL



TYPED NAME AND TITLE

Dr. Neil M. Dubrovsky, Chief, Central Valley Programs

DATE April 14, 1999

APPLICATION FOR FEDERAL ASSISTANCE

OMB Approval No. 0348

1. TYPE OF SUBMISSION: Application <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Non-Construction Preapplication <input type="checkbox"/> Construction <input type="checkbox"/> Non-Construction		2. DATE SUBMITTED 4-14-99	Applicant Identifier N/A
		3. DATE RECEIVED BY STATE N/A	State Application Identifier N/A
		4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier

5. APPLICANT INFORMATION Legal Name: <u>U.S. Geological Survey</u> Address (give city, county, State, and zip code): Placer Hall, 6000 J Street Sacramento, CA 95819-6129		Organizational Unit: <u>Water Resources Division</u> Name and telephone number of person to be contacted on matters involving this application (give area code): <u>Larry Brown (916) 278-3098</u>																												
6. EMPLOYER IDENTIFICATION NUMBER (EIN): <div style="border: 1px solid black; padding: 2px; display: inline-block;"> 53-0196958 </div>	7. TYPE OF APPLICANT: (enter appropriate letter in box) <div style="display: flex; justify-content: space-between;"> <div> A. State B. County C. Municipal D. Township E. Interstate F. Intermunicipal G. Special District </div> <div> H. Independent School Dist. I. State Controlled Institution of Higher Learning J. Private University K. Indian Tribe L. Individual M. Profit Organization N. Other (Specify) <u>federal</u> </div> </div>																													
8. TYPE OF APPLICATION: <input checked="" type="checkbox"/> New <input type="checkbox"/> Continuation <input type="checkbox"/> Revision If Revision, enter appropriate letter(s) in box(es) <input type="checkbox"/> <input type="checkbox"/> A. Increase Award B. Decrease Award C. Increase Duration D. Decrease Duration Other(specify): _____		9. NAME OF FEDERAL AGENCY: <u>U.S. Geological Survey</u>																												
10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: <div style="border: 1px solid black; padding: 2px; display: inline-block;"> - </div> TITLE: <u>N/A</u>		11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT: <u>Assessment of habitat use, trophic status, contaminant loads, and distribution of the Chinese mitten crab (Eriocheir sinensis) in the freshwater habitats of the Sacramento and San Joaquin River Basins.</u>																												
12. AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.): <u>Butte, Calaveras, Colusa, Contra Costa, Glenn, Fresno, Merced, Madera, Nevada, Placer, Contra</u>																														
13. PROPOSED PROJECT Start Date: <u>3/00</u> Ending Date: <u>6/01</u>	14. CONGRESSIONAL DISTRICTS OF: a. Applicant: <u>3.5</u> b. Project: <u>3</u> <u>Sacramento, San Joaquin, Solano, Stanislaus, Sutter, and Yolo</u>																													
15. ESTIMATED FUNDING: <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>a. Federal</td> <td>\$</td> <td>343,038</td> <td>00</td> </tr> <tr> <td>b. Applicant</td> <td>\$</td> <td></td> <td>00</td> </tr> <tr> <td>c. State</td> <td>\$</td> <td></td> <td>00</td> </tr> <tr> <td>d. Local</td> <td>\$</td> <td></td> <td>00</td> </tr> <tr> <td>e. Other</td> <td>\$</td> <td></td> <td>00</td> </tr> <tr> <td>f. Program Income</td> <td>\$</td> <td></td> <td>00</td> </tr> <tr> <td>g. TOTAL</td> <td>\$</td> <td></td> <td>00</td> </tr> </table>		a. Federal	\$	343,038	00	b. Applicant	\$		00	c. State	\$		00	d. Local	\$		00	e. Other	\$		00	f. Program Income	\$		00	g. TOTAL	\$		00	16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS? a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON: DATE: _____ b. No. <input type="checkbox"/> PROGRAM IS NOT COVERED BY E. O. 12372 <input type="checkbox"/> OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW
a. Federal	\$	343,038	00																											
b. Applicant	\$		00																											
c. State	\$		00																											
d. Local	\$		00																											
e. Other	\$		00																											
f. Program Income	\$		00																											
g. TOTAL	\$		00																											
17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT? <input type="checkbox"/> Yes If "Yes," attach an explanation. <input type="checkbox"/> No																														
18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.																														
a. Type Name of Authorized Representative <u>Dr. Neil M. Dubrovsky</u>		c. Telephone Number <u>(916) 278-3078</u>																												
d. Signature of Authorized Representative 		e. Date Signed																												

BUDGET INFORMATION - Non-Construction Programs**SECTION A - BUDGET SUMMARY**

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
Research		\$	\$	\$ 343,038	\$	\$ 343,038
Totals		\$	\$	\$	\$	\$

SECTION B - BUDGET CATEGORIES

Subject Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total (5)
	(1)	(2)	(3)	(4)	
a. Personnel	\$	\$	\$ 105,597	\$	\$
b. Fringe Benefits					
c. Travel			12,000		
d. Equipment			32,808		
e. Supplies			20,809		
f. Contractual			171,824		
g. Construction					
h. Other					
i. Total Direct Charges (sum of 8a-8h)					
j. Indirect Charges					
k. TOTALS (sum of 6i and 6j)	\$	\$	\$ 343,038	\$	\$
Program Income	\$	\$	\$	\$	\$

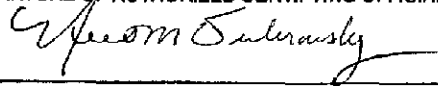
SECTION C - NON-FEDERAL RESOURCES				
(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
	\$	\$	\$	\$
TOTAL (sum of lines 8 - 11)	\$	\$	\$	\$

SECTION D - FORECASTED CASH NEEDS					
	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Federal	\$	\$	\$	\$	\$
NonFederal					
TOTAL (sum of lines 13 and 14)					

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT				
(a) Grant Program	FUTURE FUNDING PERIODS (Years)			
	(b) First	(c) Second	(d) Third	(e) Fourth
March 01, 2000 - June 31, 2001	\$ 343,038	\$	\$	\$
TOTAL (sum of lines 16-19)	\$	\$	\$	\$

SECTION F - OTHER BUDGET INFORMATION	
Direct Charges: \$343,038	22. Indirect Charges:
Remarks:	

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL 	TITLE Chief, Central Valley Programs	
APPLICANT ORGANIZATION U.S. Geological Survey, WRD	DATE SUBMITTED 4-15-99	